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FAMILY LYCEUM.

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BIOGRAPHY.

LINNÆUS.

LINNÆUS, the most celebrated naturalist of his age, was a native of Sweden. He was the son of a clergyman, and was born May 13, old style, 1707, at Rœshult, in the province of Smaland. His father was fond of gardening, and his little domain was stocked with plants not commonly cultivated—a circumstance to which the prevailing taste of the son may be fairly attributed. He was sent to the grammar-school, and afterwards to the gymnasium of Wexio, to be educated for the ministry; but, as he disliked the studies of the school, and preferred to collect plants and catch butterflies, he remained behind his fellow-pupils in Latin and Greek, and his teachers declared to his father that he was only fit for a mechanic. The father sent him to a shoemaker; but the physician Rothmann, having discovered talents in the boy, induced his parents to let him study.—As botany afforded him no prospect of a support, Linnæus was obliged to study medicine. In 1727, he entered at the university of Lund in Scania, whence he removed, the following year, to Upsal. During his early residence there, the narrowness of his father's circumstances exposed him to great difficulties, from which he was relieved by the patronage of Celsius, the theological professor, an eminent naturalist, who had become acquainted with him in the botanical garden at Upsal, and through whose recommendation he obtained some private pupils. He also formed a friendship with Artedi, a medical student like himself, devoted to the cultivation of natural history. He now, in his 24th year, conceived the idea of a new arrangement of plants, or the sexual system of botany, relative to which he wrote a memoir, which was shown to Rudbeck, the botanical professor, who was so struck with its ingenuity, that he received the author into his house, as tutor to his sons, and made him his assistant in the office of delivering lectures. Forty years before, Rudbeck had made a journey to Lapland, which excited the curiosity of the learned. A new journey was now concluded upon, and, in 1732, Linnæus was sent, by the academy of sciences at Upsal, to make a tour through Lapland, from which he returned towards the close of the year. Fifty Swedish dollars were thought sufficient by Linnæus to defray his expenses, and with this small sum he made a journey of more than 3500 miles, unaccompanied. In 1733, he visited the mining district around Fahlun, and gave lectures on mineralogy, having formed a system of that science, afterwards published in his *Systema Naturæ*. While he was thus adding to his reputation at Upsal, he became involved in a violent quarrel with the medical professor, Nicholas Rosen, who seems to have acted with a great deal of illiberality, and found means to prevent Linnæus from continuing his private lectures. He therefore engaged in a scientific tour through the province of Dalecarlia, and remained for some time at Fahlun, lecturing and practising medicine with considerable success. He again went to Lapland on a mineralogical tour with seven young men; and, in 1735, published a complete *Flora* of this country—a classical work. In the same year, he went to the university of Harderwyck, in Holland, and took the degree of M. D. He then visited Leyden, where the first sketch of his *Systema Naturæ* was printed in the form of tables, filling 12 folio pages. He became acquainted with John Frederic Gronovius, Boerhaave, and John Burman of Amsterdam; and he then published a work, entitled *Fundamenta Botanica*, exhibiting the basis of his botanical system. Mr. Clifford, a rich merchant of Amsterdam, made him superintendent of his garden at Hartecamp, near Haerlem, rich in curious exotics, of which Linnæus drew up a systematic catalogue. In 1736, he made a visit to England. He returned to Holland with many new plants for Mr. Clifford's garden, his description of which, entitled *Hortus Cliffortianus*, with 37 plates, was now published in a most splendid form. He also published the first edition of his *Genera Plantarum*. In 1738, he made an excursion to Paris, and, towards the end of that year, returned to his native country, and settled as a physician at Stockholm. At first, he experienced neglect; but, through the influence of count Tessino, he was appointed physician to the navy, and had a salary for giving public lectures on botany in the summer, and on mineralogy in the winter. The establishment of the royal academy of Stockholm, of which he was one of the first members, contributed to the advancement of his reputation, by the opportunities which it afforded for the display of his abilities. In 1741, he succeeded Roberg in the professorship of medicine at Upsal, to which was added the superintendence of the botanic garden, to the new arrangement and augmentation of which he devoted much of his time and attention. In 1745, appeared his *Flora Suecica*, and in the next year his catalogue of Swedish animals, entitled *Fauna Suecica*. He was elected to the post of secretary of the academy of sciences at Upsal. In 1746, an honorary medal of him was struck at the expense of some noblemen; and, in 1747, he was nominated royal archiater. Through his influence, many young naturalists were sent to explore various countries; and to his zeal in the cause of science we owe the discoveries in natural history made by Kalm, Osbeck, Hasselquist and Loefling. He was employed by the queen of Sweden to describe her museum at Drottningholm, when he made a new scientific arrangement of the shells contained in it.—About 1751, he published his *Philosophia Botanica*, and, in 1753, his *Species Plantarum*, containing a description of every known plant, arranged according to the sexual system. This work of Linnæus, which Haller terms his *Maximum Opus et Æternum*, appeared originally in two volumes, 8vo.; but the edition published by Willdenow at Berlin, 1799—1810, is extended to ten volumes. In 1753, this great naturalist was created a knight of the polar star—an honor never before bestowed on a literary man. In 1761, he was elevated to the rank of nobility.—Literary honors were also conferred on him by scientific societies in foreign countries.—In 1768, he completed the plan of his *Systema Naturæ*, which, through successive editions, had been enlarged to three octavo volumes. Linnæus acquired a moderate degree of opulence, sufficient to enable him to purchase an estate and mansion at Hammarby, near Upsal, where he chiefly resided during the last 15 years of his life. There he had a museum of natural history, on which he gave lectures, and to which he was constantly making additions, from the contributions of travellers and men of science in various parts of the world. His health, during a great part of his life, enabled him to pursue his researches with vigor and activity; but in May, 1774, he had an apoplectic attack, which obliged him to relinquish the most laborious part of his professional duties, and close his literary labors. A second attack occurred in 1776, and he afterwards experienced a third; but his death did not take place till January 11, 1778. Besides his works on natural history, he published a classified *Materia Medica*, and a systematic treatise on nosology, entitled *Genera Morborum*. Few men in the history of science have shown such boldness, zeal, activity and sagacity as Linnæus: natural science is under unspeakable obligations to him, though the different systems established by him may be superseded by more perfect ones. Charles XIV, king of Sweden, in 1819, ordered a monument to be erected to him in his native place. By his wife, the daughter of a physician at Fahlun, he had a son and four daughters. The former, *Charles von Linnæus, jun.*, was joint-professor of botany, and afterwards professor of medicine at Upsal. He was well acquainted with science, but distinguished himself by no discoveries of importance. On his death, without issue, in 1783, the family became extinct. *Elizabeth Christina von Linnæus*, one of the daughters of the great naturalist, studied botany, and became known by her discovery of the luminous property of the flower of the *tropæolum*, of which an account was communicated to the academy of Stockholm.—[*Encyclopædia Americana*

FAMILY CABINETS.—Cabinets of Natural History commenced in Lyceums, soon extend themselves into Schools, and from schools they find a direct conveyance into Families: or, as is not unfrequently the case, if an individual in a family makes a collection, it gives rise to one in a school, and thence in the Lyceum both for the town and country, and finally leads to a State collection.

FUEL.

ANTHRACITE COAL.

IN a recent visit to Mauch Chunk and the vallies of Wyoming and Lackawana, I was struck with the universal employment of anthracite in the blacksmiths' shops of those regions, and with the strong terms in which the workmen expressed their preference for it over every other kind of coal. To use their own words—'they would not substitute charcoal, if it were brought and offered them for nothing, at their doors.' Though familiar with it in the grates of parlors and in furnaces, on our sea-board, the present was a use to which I had not hitherto seen it applied. I gave the subject some attention, and as the results may be useful to the public, will endeavor to offer them.

THE KIND OF COAL TO BE EMPLOYED.

Every one, familiar with anthracite, in place, knows that its varieties, even in the same bed, are very great. Some of the strata are usually slaty, portions of others are charged with sulphuret of iron, (iron pyrites,) while other parts, generally far the greater portion, are almost entirely carbonaceous. The last is always preferred by the smiths, and the value of pure coal to them is so well known, that in one mine, near Wilkesbarre, which we visited, a stratum was reserved for them, the coal from which was sold for two dollars per ton, while for the remainder but half this price was demanded. As the proprietors of the different mines, however, are desirous of acquiring a good reputation for their coal, only the best is now sent to the sea-board, and it is probable that but a small portion of the anthracite in our market is unfit for the heating of iron. The proper coal is easily distinguished: I seated myself by a heap of anthracite, near a smith's shop, in Wilkesbarre, and with a little assistance from the owner learned, in five minutes, to discriminate between the different kinds. The slaty coal is inferior in lustre, and an experienced eye will easily distinguish the delicate lines of the slate: its fracture is also even, while that of the pure anthracite is more or less conchoidal. The sulphuret of iron forms usually fine white specks, and may be easily observed from its contrast with the glossy jet of the coal. If any difficulty, however, is found in making the distinction before heating, there can be none when the coal is in the furnace. The slaty coal soon becomes covered with a white ashy coat, and has a dull appearance: the pyritous coal has a bright glow, but on being moved, will send up numberless brilliant sparks; its smell is also stronger, but the smiths rely more on the former circumstance than on the smell.—The slaty coal will not injure the iron; its only evil is in the inferior degree of heat it affords. The case is different with the pyritous anthracite. Yellow iron pyrites is a bi-sulphuret: when heated, one proportional of its sulphur combines with the bar to be forged, making it a proto-sulphuret, and giving consequently a brittle character, which renders it difficult to be wrought. When in small quantities, however, neither the slaty nor the pyritous coal is to be dreaded: if the latter is in larger proportion, the smiths find an easy security from its influence, by throwing common salt upon the fire. Only a small quantity is needed: they simply scatter it upon the ignited coal, and then work confidently, as in other cases: I was informed that it is uniformly effectual. Salt is sometimes used by them to assist in igniting the anthracite: I have observed, since my return, that it is also used as a guard against sulphur in bituminous coal.

THE MANNER OF CONSTRUCTING THE FURNACE.

The general construction need not differ from that in other shops, the bellows and the hearth being the same. The tuyere-iron, (pronounced by the smiths as if spelt *tue-iron*,) however, must have a greater diameter: in the shops which I have examined, it varied from three fourths of an inch to an inch; about seven eighths of an inch, for the inside diameter, was usually considered the best. As there are no sparks or smoke, a chimney is not needed; and although one might be of service in carrying off the gases which arise from the coal, the shops at Wilkesbarre are usually constructed without any chimney, an opening in the gable end near the roof being found to answer the purpose nearly as well: even this is used only during the summer. In visiting these shops, a person is struck with the cleanly appearance of the workmen, the dust from anthracite, though penetrating, not being of a character to soil either furniture or clothes: I frequently heard the workmen speak boastingly of the fact that they could now be as clean and comfortable as persons engaged in any other trade.

THE MANNER OF USING THE COAL.

Charcoal or dry wood is requisite for igniting the anthracite; when fairly ignited, it will need no foreign help, provided the iron to be heated is small and is to be operated upon to no great extent at one time. If the bar is large and requires a diffused heat, a small quantity of charcoal must be mingled with the anthracite, as without this, the bellows are not able to ignite a large quantity of the mineral coal. The iron to be heated should not be thrust down so near the tuyere-iron as is the case when charcoal is employed. Most of the failures, at the first use of anthracite, I was informed, arise from ignorance of this circumstance, from having the diameter of the tuyere-iron too small, and from leaving the iron too long upon the fire. Anthracite will heat a bar in one half the time that is requisite for charcoal, and until the blacksmith is familiar with its use, the heating process must be closely observed, or the iron will be burnt, before he thinks that it has been sufficiently heated. The bar may easily be watched, as from its being so far above the tuyere-iron, the quantity of coal above it is smaller than in the charcoal furnace, and it may be kept constantly in sight. While in the fire it should be suffered to remain undisturbed; if moved about, as is common in the charcoal fires, the heating will be retarded.

ADVANTAGES OF THE ANTHRACITE COAL.

Some of these may be inferred from the preceding remarks. They consist chiefly in the saving of time and of money. From the rapidity with which the iron is heated, the quantity of work done is about one third greater than when charcoal is employed.—The gain, as respects the cost of materials, will depend on the price of anthracite, which, from its weight, increases rapidly in value as we recede from the mines. The Carbondale Company state that they will be able to offer it in the New York market, the coming season, for $6,50 per ton; and the time will soon arrive, when from the increased facilities for transportation from the various coal regions, and from the rivalry of the different companies, this fuel may be had at a price far less. At its present cost, however, even at remote places, it is much cheaper than charcoal. A ton of anthracite will heat as much iron as two hundred bushels of the latter, which at the average price of seven or eight dollars per hundred bushels, will give a saving of about one half in favor of the anthracite. I visited a shop sixty-five miles from Mauch Chunk, from which mine the owner was in the habit of bringing his coal in wagons: he said it cost him ten dollars per ton, delivered at his door, but that even at this price it produced a saving of 80 per cent. in his material, and he seldom employed any other coal. The use of it has extended to a considerable distance, in all directions from the coal region, and is now increasing rapidly in Philadelphia: in a few years, it will probably be general throughout the country. The first effort at employing it, will generally be attended by difficulties: sometimes the smith fails entirely, and throws it by in disgust; but I believe I have not heard of one case, in which a fair trial has been made, that has not resulted in a great fondness for this species of coal. Still, however, its best friends acknowledge that for some purposes it is not well adapted.—When a *hollow heat* is requisite, it will not answer; nor will it suit in forges where the fire must be greatly disturbed by the removal and replacement of the bar. It is said also not to be good for *tempering*, but I have seen it employed for this, and in Mons. Brard's *Mineralogie appliquee aux arts*, I observe it is spoken of as highly useful in the manufacture of a variety of delicate edge tools. —[*Silliman's Journal of Science.*

GEOLOGY OF THE UNITED STATES.—Col Johnson, from the committee on military affairs, made a report to the House of Representatives, Feb. 21, in favor of a mineralogical and geological survey, and map of the whole territory of the United States, to be executed in connexion with the other duties of the Topographical Bureau.

Gipseys of Granada.

Cervantes begins his beautiful novel of the *Gitanilla*, in which he illustrates the pranks of the Gipsies, with the following not very flattering exordium:—'It would seem that the Gitanos and Gitanas were solely born into the world to fill the station of thieves. They are brought up among thieves, they study the profession of thieves, and finally end by becoming thieves, the most current and thorough-paced on the face of the earth.' The history of our species furnishes no study more singular than that of this unaccountable race, which, emigrating from the east, overran the whole of Europe, and pushed its way onward, not by the force of the sword, but by begging and stealing; and at the same time that they conformed in some particulars of dress, manners, customs, and religion, to the countries in which they settled, in others retained every where a common character, common propensities, and common occupations.

The Gipseys are found in no part of Spain except Andalusia, which, in their soft and lisping Spanish, they call *la tierra de Dios*; *la tierra de Maria Santisima*; the land of God—the land of the most holy Virgin. They either live in the ruinous purlieus of the great cities, or else wander from place to place, the women carrying their children naked, slung from their shoulders, or dangling with one arm around them upon their hips. In Andalusia, as elsewhere, they gain their bread by tinkering, stealing, and fortune-telling; and preserve the common tradition of an Egyptian descent. It is in Granada, however, that they most abound, just as the skippers are found in greatest numbers in the best cheese. They have their habitations in the caves of the Albaycin, where they practise little arts in lock and spoon making and basket work, their commodities having the common reputation of being worthless and catch-penny. To vend them, they take their stations in the Vivaramble, where they may always be seen seated at the shady side of the square, and never shifting their births until dislodged by the sun. Their chief revenue arises from shaving their favorite water-dogs, of which there is one in almost every family; and I have often been amused at seeing the four paws of one of these animals, as he impatiently submitted to this process of decoration, held by as many young Gipseys in as many different directions, whilst the old crone, their mother, divested him of his fleece. These people are almost universally tall and well made, their figures and carriage having, in a rare degree, the air of freedom and unconstraint. The women are very beautiful, their features, as well as those of the men, being very regular; with an Asiatic complexion and cast of countenance; long, straight, and very black hair; full dark eyes, and teeth of pearly whiteness. They are all fond of appearing in the worn-out finery of the Andalusian dandies, and have a taste for elegance, though it be even in rags. Their pranks are often exhibited on the Spanish stage, to the great delight of the audience, who receive their quaint practical jokes and less innocent rogueries with the greatest glee. Indeed they have the character of being a light-hearted and happy race, and, notwithstanding their vicious propensities, are looked on with an extra share of that indulgence which is extended to vagrants of all classes in Spain.

There is much in the cast of countenance, complexion, and unfettered confirmation of these Gipseys, in connection with their mendicant air and the distinctness of their appearance, character, and sympathies, from those of the Spaniards around them, to remind an American of the vagrant Indians whom he has seen loitering about the frontier settlements of his native country. The Gipseys of Spain do not, however, excite the same sympathy as our unhappy aborigines. They came to that country of their own accord, and with a view to better their condition, bringing their vices with them, and making them instrumental to self-support and to the preservation of their identity.—But the Indians, instead of dispossessing, are the dispossessed; their degradation, instead of being derived from their savage state, has supplanted the wild virtues that adorned it; and is at once the result of civilized encroachment and the efficient cause of their ruin.

It was in order to see something of the domestic economy of this strange race, of whom we daily met many in the streets of Granada, that we one morning took a walk to the caves of the Albaycin, where they have their subterranean habitations. Crossing the ravine of the Darro, and passing through the more populous portion of the Albaycin, whose houses are often incorporated with the ruins of walls, that mark the gradual expansion of Granada, as it augmented its population in the days of the Saracens, we began at length to ascend the more precipitous portion of the rival mountain, where it looks towards the valley of Darro and the fortress of the Alhambra.—The Albaycin may be called the rival of the Alhambra, not only from its position immediately opposite, the two mountains being drawn up on either side of the Darro, and forming upon each other the Pillars of Hercules in miniature; but because in Moorish days it was crowned with a fortress of nearly equal strength, which sometimes arrayed itself in hostility. When two kings reigned not only in the same kingdom, but in the single city of Granada, it was the fortress of the Albaycin that formed the court and strong-hold of Boabdil el Chico. Of this fortress scarce a vestige now remains; it doubtless dates demolition from the period when, after the conquest, the Moriscos were compelled to take up their abode within the precincts of the Albaycin.

As we went on ascending the streets of the Albaycin, we passed gradually into zig-zag pathways winding their way up the acclivity; and the houses rising above each other along the hill-side, gave place to caves artificially hollowed beneath the surface of the earth. The whole superior part of the mountain was perforated like a honeycomb, and contained within its bowels a numerous population, of which, however, none of the ordinary indications could be discovered, except the wreaths of thin smoke which rose in every direction, curling among the prickly-pear bushes, which covered the whole surface, and furnished food to the poor inhabitants who lived below. At one of the first caves we managed an invitation to walk in, by asking a decent old woman for some water. When within the door, and we began to recover our sight, we found ourselves in an apartment of regular figure, and wanting none of the comforts of life.—A fire-place stood in front of the entrance, its chimney being perforated upwards through the rock. On the right was the door of the principal bed-room; it had a circular window or loop-hole, was very clean and neat, and was ornamented with crosses, artificial flowers, and rude paintings of the saints. There were other apartments, penetrating farther into the recesses of the mountain, and which received no light from without; these served for sleeping-chambers and store-rooms. The rock here, like that of the adjoining mountain, which contains the Mazmorras, is of a soft nature, and is easily cut, but hardens by exposure to the air. The caves that are hewn in it are more comfortable than the ordinary habitations of the poor, keep out the weather effectually, and being less subject to changes of temperature, are comparatively warm in winter and cool in summer.

Taking leave of our old woman and her cave, we proceeded eastward along the acclivity, until we found ourselves among the more wretched of these subterranean dwellings, the fit abode of Gipseys, vagabonds, and robbers. Having singled out one which we supposed to belong to the first of those honorable classes, from a group of tawny and more than half naked children, whom we found at their gambols before the door, we took the liberty of entering it, after the utterance of an *ave Maria purisima*. We found no one within but a young Gipsey girl, seated on the stone floor, surrounded by a litter of straw, which she was sleepily weaving into braid for a bonnet. Beside her was a wild shaggy dog, which, like those of our Indians, seemed to have adapted himself to the strange life of his masters, and gone back to his original wolf-like condition. The dog is an accommodating animal; not only in manners, habit, and character, but even in his appearance, he learns to assimilate himself to his owner. The dog of a prince takes something of a prince's pomposity; the butcher's dog shares in the butcher's fierceness; the dog of a thief may be easily known by his skulking air; and that of the poor beggar learns to look as humble and imploring as his master. The theory may fail as often as any other theory—but at all events it applied to the treacherous cur who now growled at our intrusion, until it was sanctioned by his mistress; when, though he ceased his menacings, he took his station beside her, and still kept a watchful and lowering eye upon us. The young woman, too, seemed embarrassed by our presence; and when we would have our fortunes told, she pleaded ignorance, bade us come when her mother should be there, and appeared willing to be rid of us. Ere we relieved her of our presence, we had time to remark that, though neither very clean nor very tidy, she was yet pretty as Preciosa herself. Her features were regular and expressive, with glowing eyes, and her form finely moulded, and unperverted by artificial embarrassments. She had moreover a modest look, and seemed to justify the idea, that chastity could exist, as it is said to do, in so humble and unfettered a condition. Indeed, whatever may be the vices of the Spanish Gipseys, Cervantes tells us that they respect this virtue both in their wives and damsels, forming none but permanent connexions, which, though not sanctioned by matrimony, are only broken by common consent. He gives them credit, too, for assuming in an eminent degree towards each other the laws and obligations of friendship. They do not take the trouble to pursue crimes committed among them before the tribunals of the country; but, like many others in Spain who are not Gipseys, execute justice on their own account. —[*Tales of the Alhambra.*

Attraction.

By *attraction* we mean the tendency that bodies have to approach each other. And first, in elucidation of this subject, if you throw a stone, or shoot an arrow into the air, instead of proceeding according to the direction in which you send it, you see its course is quickly spent, and it returns to the earth with a velocity or swiftness proportioned to its bulk or weight. Now, it is easy to conceive, that the resistance of the air may stop it in its progress; but why should it return? Why should not the resistance of the air stop or impede it in its return?

The answer you will think very plain—It is its *weight* that brings it back to the earth, you will say, and it falls because it is a heavy body. But what is weight? Or why is it heavy? It is, in truth, the earth which draws or *attracts* the stone or the arrow towards it; this overcomes the force with which you sent it from you at first, and the resistance which the air would otherwise make to its falling.

To make this plainer, if you drop a little water, or any other liquid, on a table, and place upon the liquid a piece of loaf sugar, you will see the water or fluid ascend, or in vulgar language, be sucked up into the pores of the sugar; that is, the one attracted by the other. Again, if you take two leaden bullets, and pare a piece off the side of each, and make the surface, where you have taken off the piece, exceedingly smooth, and then press the two balls together, you will find them adhere strongly together, that is, they are mutually attracted by each other.

If you take a piece of sealing wax, or amber, with a smooth surface, and rub it pretty quickly upon your woollen stocking till it gets warm, you will find that if straws, feathers, hairs, or any very light bodies, are brought within the distance of from an inch to half an inch of it, these light bodies will be drawn to the sealing wax or amber, and will adhere to it. Thus, in philosophical language, they are attracted by it.

This last effect is very similar to what may be observed of the magnet or loadstone, or what is frequently performed by the little artificial magnets, which are commonly sold, and which afford a very rational and pretty amusement to young persons.

But what is a still more surprising effect of attraction, if we take two phial bottles, which we number 1 & 2, and fill each of them with a fluid perfectly colourless; we see they appear like clear water: on mixing them together, we will observe the mixture becomes perfectly black. We take another phial, No. 3, which contains also a colourless fluid, and we pour it into this black liquor, which again becomes, we see, perfectly clear, except a little sediment which remains at bottom. Lastly, we take the phial, No. 4, containing also a liquid clear like water, and by adding a little of it, the black colour we see is restored.

All this appears like magic, but it is nothing more than the effect of attraction. Philosophy keeps no secrets, and we will explain it. The colourless liquor in the phial, No. 1, is water in which bruised galls have been steeped or infused; that in No. 2 is a *solution of copperas*, (called by chemists *sal martis*, salt of steel) in plain terms, it is water in which common copperas, or green vitriol, is dissolved. The iron which this salt (green vitriol) contains, has a strong attraction for the gall water; and when they are mixed together they unite, and the mixture becomes black; in fact, is made into ink. But when the phial, No. 3, which contains aqua fortis (or the nitrous acid, as it is called by the chemists), is poured in, the iron, which has a stronger attraction for it than for the galls, unites with it, and having left the galls, the liquid is again clear.

Again, the phial No. 4, contains salt of wormwood in a fluid state, which the chemists call an *alkali*. The aqua fortis is nitrous acid, therefore, has a stronger attraction for this alkaline matter than it has for the iron; it therefore drops the iron, which again unites with the matter of the galls, and you see the fluid resume its black complexion. These several kinds of attractions, which we have now mentioned, philosophers have arranged under five distinct heads. The *first*, that we mean, of the stone or arrow falling to the ground, they have called the attraction of *gravity*, or gravitation.

The second, that of the two leaden balls adhering together, and of the water ascending into the pores of the sugar, they call the attraction of *cohesion*, and also capillary attraction. The third is *electrical* attraction, because the sealing wax, when chafed or warmed by rubbing against your stocking, is in an electrified or excited state, like the glass cylinder of an electrical machine, when rubbed against the cushion, and therefore attracts the hair, feathers, &c. The fourth is the *magnetic* attraction; and the fifth is called *chemical* attraction, or the attraction of combination, because upon it many of the processes and experiments in chemistry depend; and because by this means most of the combinations which we observe in salts, the ores of metals, and other mineral bodies, are effected.

On the two first of these species of attraction only we shall at present enlarge, because it will be necessary to treat of the others, when we come to investigate those branches of science to which they properly belong.

First, therefore, of gravitation. It requires no experiment to show the attraction of gravity; for since the earth is in the form of a globe, it is manifest that it must be endued with a power of attraction to keep upon its surface, the various bodies which exists there, without their being hurled away into the immensity of space in the course of its rotary diurnal (or daily) motion. The earth has therefore been compared to a large magnet, which attracts all smaller bodies towards its centre. This is the true cause of *weight* or *gravity* (which mean the same thing.) All bodies are drawn towards the earth by the force of its attraction, and this attraction is exerted in proportion to the quantity of solid matter which any body contains.—Thus, when two bodies are placed in opposite scales, and we see one preponderate, we say it is heavier than the other; in fact, that it contains a greater quantity of solid matter. For as every particle of matter is attracted by the earth, the greater number of such particles any body contains, the more forcibly it will be attracted. We know, by experience, that the *weight* or *gravity* of a body or thing is not in proportion to its bulk. A bullet of lead, of the same size as one of wood, or of cork, will weigh infinitely heavier, and one of gold would be heavier still. It is reasonable, therefore, to suppose that the ball of gold, or of lead, contains a greater number of solid particles, which are united or pressed closer together than those of the wood or cork, which is more porous, and its particles lie less closely compressed or compacted together. This, then, is what is meant by *specific gravity*, that one body contains more solid particles within a certain compass, size, bulk, or space than another.

It is one of the laws of nature, discovered by Newton, and now received by all philosophers, that every particle of matter gravitates towards every other particle; which law is the main principle in the Newtonian philosophy. The planets and comets all gravitate towards the sun, and towards each other, as well as the sun towards them, and that in proportion to the quantity of matter in each.

All terrestrial bodies tend toward a point, which is either accurately, or very nearly, the centre of the earth; consequently, bodies fall every where perpendicular to its surface, and therefore on opposite sides in opposite directions. As it acts upon all bodies in proportion to their quantities of matter, it is this attractive force that constitutes the weight of bodies.

The cause of gravity is totally unknown. Many theories have been invented to account for it, but they have been all mere hypotheses or conjectures, without any solid foundation.

II. The *attraction of cohesion* is observable in almost every natural object, since in reality it is that which holds their parts together. It has been already demonstrated, in the experiment of the two leaden balls, and the same effect will be proved by pressing together the smooth surfaces of two pieces of looking-glass, particularly if a little moisture is dropped between them to exclude the air more perfectly. The adhesion or tenacity of all bodies is supposed to depend on the degree of this attraction which exists between their particles; and the cohesive power of several solid substances has been ascertained by a course of experiments, in which it was to put to the test what weight a piece of each body of

one tenth of an inch diameter would sustain, and the weights were found to be as follow:

Raw flax . . .	37 lbs.	Ash . . .	50 lbs.
Horse hair . . .	45	Zinc . . .	18
Raw hemp. . .	46	Lead . . .	29 1-4
Raw silk	53 1-2	Tin	40 1-2
Fir wood . . .	23	Copper . .	299
Elm	35	Brass . . .	360
Alder	40	Silver . .	370
Oak	48	Iron . . .	450
Beech	50	Gold . .	500

This cohesion is also visible even in fluid substances, the particles of which adhere together, though with a less degree of tenacity than solid bodies 'The pearly dew' is a well known phrase in poetical language, and the drops of rain, or of dew, upon the leaves of plants, assume this round or pearly appearance by the attraction which the particles have for one another. In the same manner quicksilver, if divided into the smallest grains, will appear round, like small shot, because the particles attract each other equally in every direction, and thus each particle draws others to it on every side, as far as its power extends. For the same reason, two small drops of quicksilver, when brought near to each other, will seem to run together and unite.

Some bodies, however, in certain circumstances, appear to possess a power the reverse of attraction; and this is called, in philosophical language, *repulsion*.—[*Young Man's Book of Knowledge.*

Motion.

Motion is the term applied to the changing of place among bodies.

Were there no motion in the universe, it would be dead. It would be without the rising or setting sun, or river-flow, or moving winds, or sound, or light, or animal existence. To understanding the nature and laws of the motions or changes which are going on around him, is to man of the greatest importance, as it enables him to adapt his actions to what is coming in futurity, and often to interfere so as to control and direct futurity, for his special purposes.

Motion is described in any particular case, by referring to certain objects and certain standards of velocity. A man sitting on the deck of a sailing ship has *common* motion with the ship: if walking on the deck, he has *relative* motion to the ship: but if he be walking towards the stern, just as fast as the ship advances, he is at rest relatively to the bottom or shore. A ship sailing against the tide, just as fast as the tide runs, has rest relatively both to the earth and water. *Absolute* motion is that which is relative to the whole universe, or to the space in which the universe exists. We have no means of ascertaining such: for although we know how fast our globe whirls upon its axis and round the sun, we have no measure of the motion of the sun himself—revolving probably round some more distant centre, and carrying all the planets along with him.

Motion is called *rapid*, as that of lightning —*slow*, as that of the sun-dial shadow: both terms having reference to ordinary intermediate velocities. It is called *straight* or *rectilineal*, in the observed path of a falling body—*bent*, or *curvilinear*, in the track of a bullet shot obliquely—*accelerated*, in a stone falling to the earth—*retarded*, in the stone thrown upwards while rising to the point where it stops before again descending.——[*Arnott's Physics.*

School Lyceum.

On Monday evening last we were highly gratified with hearing a lecture from a member of the Bowdoin Street School Lyceum. The interest manifested by the ladies and gentlemen present, as well as the members of the Lyceum and school, spoke well for the skill of the lecturer. His subject was the atmosphere, the properties of which were well explained, and beautifully illustrated by a variety of experiments which were at once amusing and instructive.

We should like to inquire of the members of other schools, if they are not able and disposed to go and do likewise?

Lotteries.—Notwithstanding the rain, the lecture on Lotteries, given at the Temple, by Mr. Gordon, on Tuesday evening last, was attended by twelve or fifteen hundred gentlemen and ladies, and great numbers were unable to find a standing-place in the Hall, and of course returned. The lecture is spoken of as equally interesting to the audience and creditable to its author. We most earnestly hope that this subject will be pursued in this and all other cities in the Union, until the public are enlightened into the nature and enormity of these swindling establishments. For ourselves, we are fully settled in the opinion, that legislatures would do a less extensive and less serious injury to society by establishing public Gambling Houses in all our principal towns, than by authorizing Lotteries.

FAMILY INSTRUCTION.

NUMBERS.

Belonging to the Family apparatus is a composing stick, or a rule fitted for arranging and transposing letters and figures. Each letter of the alphabet, (the small letters, as the others ought not to be used at first,) is on a separate card, and fitted to the composing stick; the same with the nine digits.

With these instruments children amuse themselves in forming words and combining numbers. By placing a vowel and consonant, *a, t*, in the stick, then prefixing several consonants, different words can be formed, such as cat, hat, rat, bat, fat, sat, mat, &c. By placing two consonants, and then inserting vowels, words may be formed, thus, bug, bag, bog, big, beg, &c. The ingenuity of children will invent an endless variety of such combinations.

In a similar way the digits can be used to form numbers, thus, by placing a cypher and prefixing the other figures, the child will form 10, 20, 30, 40, &c. By placing two figures and then prefixing others, 150, 250, 350, 450, &c., may be formed both for the instruction and amusement of children.

The geometrical character of the digits, also furnishes a pleasant and profitable exercise for young minds, whose attention may be called to it by such questions as the following. How many straight and how many curved lines, in the nine digits? How many vertical, and how many horizontal lines? How many right and acute angles? How many lines and angles in 4? What figure is composed of one curved and two straight lines? What figure with two straight lines has one vertical, and one horizontal. What figure is composed of two straight lines, one horizontal, and one oblique? Which is composed of one vertical straight line? Which of two curved lines? Which of one curved and one straight?

There is a double set of these digits belonging to the family apparatus, which is sufficient to vary the combinations without end, and to give children a familiar and practical knowledge of numbers in their various relations.

This exercise, aided by that of forming the figures upon slates, is a highly profitable exercise among children at home, and may be used to advantage by teachers in school to vary and simplify their illustrations in the abstract science of Aritimetic.

U. States' History.—Noah Webster, the lexicographer, has prepared a History of the United States, which contains much important and useful matter not common in other epitomes previously published; it is of course a fellow-laborer with those of Goodrich and Hale, rather than a substitute. The subject of which it treats, deserves of course to be familiar with every American.

NATURAL PHENOMENA.

CLIMATES.

The surface of the globe has been divided by geographers into sixty climates, thirty south and thirty north of the equator.—'By these climates the length of the day, from sun-setting to sun rising, is shown in its increase and decrease, proceeding from the equator to the poles. From the equator to the arctic, or northern polar circle, twenty-four climates are traced out, and through each a difference of half an hour arises in the length of the day and night—and in like manner from the equator to the antarctic, or southern polar circle. The six climates which lie between the polar circles and the poles, both the northern and the southern, differ from each other by one entire month progressively.'

The climates are not only known geographically, but they are distinguished by their different temperatures. The mean heat of the equator is 84°, and at the pole, according to analogy deduced from a comparison of various observations, 31°. At London, the mean temperature is 50°; at Rome, 60°; on the island of Madeira, 70°; and in Jamaica, 80°. Thus from the equator to the poles, north and south, there is a progressive diminution of heat. This diminution of temperature from the equator is in proportion to the obliquity of the sun's rays. The heat received at the equator by the vertical rays of the sun in the course of a year, is said to be nearly twice and a half as great as at the poles. In this way it is not difficult to account for the progressive diminution of heat as we recede from the equator; but it is more difficult to account for the varieties of temperature in the *same* latitudes. It is well known, that it is uniformly colder in a given latitude in America, than it is in the same latitude on the continent of Europe. That there are local causes of heat and cold, independent of the immediate action of the sun, there can be no doubt.—The sea is less heated than the land, owing in part, it is supposed, to the sun's rays penetrating to a considerable depth, and mixing by the agitation of the surface with the cold water below, and, in part, to the greater quantity of water that is evaporated from it.

'Small seas surrounded by land, at least in temperate and cold climates, are generally warmer in summer and colder in winter than the ocean, because they are a good deal influenced by the temperature of the land. The Gulf of Bothnia, for instance, is for the most part frozen in winter; but in summer it is sometimes heated to 70°, a degree of heat never to be found in the opposite water of the Atlantic. The German sea is above three degrees colder in winter and five degrees warmer in summer, than the Atlantic. The Mediterranean sea is, for the greater part of its extent, warmer both in summer and winter, than the Atlantic.'

Islands are found to be several degrees warmer than the continents in the same degree of latitude; and countries lying to the windward of extensive forests or mountains are usually much warmer than those lying to the leeward. The eastern parts of North America are several degrees colder than those of the opposite coast of Europe, and fall short of the temperature of the ocean, which is considered as the standard, by about 10 or 12°. The cause of this difference is owing, doubtless, to the mountainous country, immense forests, swamps, lakes, and morasses, with which the northern part of North America abounds, rendering it incapable of receiving that degree of heat which is imparted to the land of the old continent, and by which the severity of its winter is mitigated. As our country becomes more cleared of woods, and is better cultivated, there is reason to suppose that it will be milder than it now is.

The surface of the globe,—without attempting to account for the variety of climate and difference of temperature in the same latitude,—may be compared to an extensive farm, diversified with hills and dales and woods. Now every farmer knows that, on such a farm, there are cold and warm spots, though he may not be familiar with the cause of them, and which are improved accordingly. So it is with the surface of the earth, and so it ever will be till it becomes a *perfect homogeneous* sphere. D.

Young Men.—The prominent and efficient efforts now made by Young Men in various works of benevolence, constitute one of the strongest and happiest features of the present age. They come forward boldly and promptly to stay the miseries of intemperance, lotteries, and other evil works, and in support of the colonization of Africa, and the promotion of intelligence and virtue among all classes. Under such champions, any cause must succeed.

School, Agent Society.—A general invitation is given to all who may wish to become interested in the School Agent Society, either as Agents or Teachers, to meet at Andover, on the 27th of this month.—The plan and objects of the Society will then be made known, and an opportunity given for those who are disposed, to engage in some way under its patronage. A Course of Lectures and *mutual exercises*, to enable those who engage under the society to understand each other, and unite in some plan in which they can strengthen each other's hands in this great and common cause, will be then given.

Any who may meet at the Columbian Hall, Boston, on Tuesday, the 26th, at 10 o'clock A. M. and 3 P. M., may receive more full and particular information respecting the proposed lectures at Andover, and the general plan and objects of the Society.

Two Thousand Lyceum Agents.—Almost every day brings some calls for Lecturers before Lyceums, very few of which can be supplied. From the progress the Lyceum cause has now made, and from the increasing interest on the subject of Education generally, it is quite certain, that one Agent or Circuit Teacher could be most usefully and profitably employed in every county in the Union. In most counties several would be needed. Of course, to supply the ten or eleven hundred counties, two thousand at least would be required.

The more there were to engage in this cause, the stronger, and the more sure of success, would each one be. And whether the usefulness, the compensation, or the arduousness of the employment, is taken into consideration, an engagement as a Circuit Teacher or Lyceum Agent, must be far more eligible than the charge of an ordinary school.

We hope that all who have any thoughts of making teaching their profession, will take this subject under consideration, for we are sure it only needs to be understood, to recommend itself to the attention of every one who is interested in the intellectual or moral improvement of the rising generation.

By the united aid of the School Agent Society and County and Town Lyceums, ladies might render their services exceedingly useful as teachers at the West & South, either by having charge of one school through the year, or by taking several in the same vicinity, each of which they should keep a few days or a few weeks in succession, under the direction of the society which engaged them.

Without some such aid, or the protection and assistance of some friend, it is hardly advisable for a lady to go to the West to engage as a teacher. With it, any lady qualified to teach, might exert a great and good influence, in almost any place at the West or South.

Juvenile Magazines.—Every day presents some new and more animating prospect for the *self-improvement* of children. Some new instrument for themselves to wield in erecting their own character is almost daily put into their hands.

Among the most promising of these instruments is 'Parley's Magazine,' a semi-monthly, just commenced by Messrs. Lilly, Wait & Colman, of this city. The plan of the work, the specimen we have in the first number, and the well known enterprise of the publishers, together with the great facilities they must already have in their possession in cuts and other materials for rendering it interesting and useful, are sufficient to give entire confidence to every teacher and parent who may find an opportunity of procuring it.

The *Juvenile Watchman*, is another sheet designed for children, just issued by the proprietor of the Christian Watchman of this city. Although this paper proposes to make moral and religious influence its prominent object, it can hardly fail to promote sound intellectual improvement. Under such a guardian and guide as the Christian Watchman, it must be a guardian and friend to the best interests of every child who can secure it as a companion.

The *Juvenile Rambler*, now upon its second year, and well known to numerous schools and families as a most instructive inmate, is well sustained, and constantly improving in its character.

A *School Library*, to consist of a continued series of books fitted for *common schools*, is in progress, and several volumes are expected to be ready by the opening of summer schools in May next.

The Youth's Literary Gazette is published in Philadelphia, and is conducted with spirit and intelligence. It is a weekly paper, at $1 a year only. It would be singular, if a single number was not worth to every subscriber more than the expense for a year.

The Young Mechanic has well sustained its name and object for more than a year, and is constantly increasing in its circulation and interest. It is eminently a practical work, and could not fail to remunerate every practical mechanic many times over for its cost, which is but $1.

BOOK OF NATURE.

THE USES OF THE ATMOSPHERE.

We have already mentioned several of the uses of this invaluable and all-pervading fluid, in pointing out some of its most remarkable peculiarities, and all we have now to do is, to notice a few, and but a very few more, of the many unspeakable blessings and advantages derived from this necessary appendage, which the bountiful Benefactor of the human race has attached to our globe.

The air, in a peculiar manner, may be said to constitute the very essence of which life is made. When the Lord created man of the dust of the ground, he *breathed into his nostrils the breath of life*, when *man became a living soul;* and the experience of all ages amply testifies, that when men cease to breathe, which is performed by means of the air, they cease to live. Many days it has been observed we might live, or even whole months, without the light of the sun or the glimmering of a star, whereas, if we are deprived only for a few minutes of this aerial support, we sicken, we faint, we die. How thankful then ought we to be, that of this indispensable necessary of life, no person can deprive us. The treasures of the earth, the verdure of the fields, and even the refreshments of the stream, often contribute to the luxuries of the great, while the less fortunate can only behold them as humble spectators; but, in the words of an eminent naturalist, 'the air no limitations can bound, nor any landmarks restrain. In this benign element, all mankind can boast an equal possession; and for this we have all equal obligations to Heaven.'

It is equally beneficial to all the branches of the *animal* creation; for although some creatures dwell in the very bowels of the earth, or swim in the unmeasurable depths of the sea, yet it has been demonstrated by experiment, that no sooner are they totally deprived of air than they cease to live. By the same air, also, that preserves animal life, *flame* is fed and cherished. We all know the utility of fire, and the many inconveniences to which we would be exposed, were we deprived of that necessary element, but without air, in vain would the faggots be piled in a heap, in vain would we apply the lighted torch. Every attempt to set the hearth in a blaze, in order to render our habitations more comfortable during the chilling damps of winter, and every effort to dispel the midnight gloom by the cheering candle, would prove abortive. Take but away the surrounding air, life expires, and the lighted taper goes out in darkness: for even an ordinary candle is said to consume about a gallon of air in a minute!

Plants are also dependent on the air for support and nourishment, and they cannot possibly exist without it. They are continually imbibing fresh nutriment from the atmosphere. It is this wondrous fluid that helps to transfuse vegetable vigor into the trunk of the mighty oak, and gives a blooming gaiety to the spreading rose.

And how wisely is its consistence calculated for answering these important purposes. It is neither too thick nor too thin; too gross nor too attenuated. It rushes with ease into our lungs, in order to inflate them in the act of respiration; it forces its way into the most minute tubes of the vegetable tribes. In fact, as Mr. Derham observes, it is a subtile and penetrating matter 'fit to pervade other bodies, to penetrate into the inmost recesses of nature; to excite, animate, and spiritualize; and, in short, to be the very soul of this lower world.'

But what is very remarkable, this wonderful fluid, so necessary for the existence of bodies, is also made use of as a most powerful agent in the hand of Providence for their destruction. It is a *chaos* containing all kinds of menstrua, and consequently possessing powers for dissolving all bodies, by which means many things which would prove nuisances to the world are put out of the way, and reduced to their first principles.

The air, as well as being the medium of light and vision, is also the great vehicle of sound, serving to convey to the ear by its undulating motion, all that diversity of noise and modulation of tone, necessary to warn us of impending danger, or attract our attention and regard. 'As I walk across the streets of London, (observes Mr. Hervey,) with my eye engaged on other objects, a dray, perhaps, with all its load, is driving down directly upon me; or, as I ride along the road, musing and unapprehensive, a chariot and six is whirling on with a rapid career, at the heels of my horse. The air, like a vigilant friend, in pain for my welfare, immediately takes the alarm; and while the danger is at a considerable distance, dispatches a courier to advertise me of the approaching mischief. The air wafts to our senses all the modulation of *music*, and the more agreeable entertainments of refined conversation.—When Cleora tunes her song, or the nightingale imitates her enchanting voice;—when wisdom takes its seat on Mitio's tongue, and flows in perspicuous periods and instructive truth amidst the chosen circle of his acquaintance;—when benevolence, associated with persuasion, dwell on Nicander's lips, and plead the cause of injured innocence or oppressed virtue;—when goodness, leagued with happiness, accompany Eusebius into the pulpit, and reclaim the libertine from the slavery of his vices; disengage the infidel from the fascination of his prejudices; and so affectionately, so pathetically, invite the whole audience to partake the unequalled joys of pure religion—in all these cases the air distributes every musical variation with the utmost exactness, and delivers the speaker's message with the most punctual fidelity.'

The air is also made highly subservient to the sense of smelling. 'It undertakes, (says the same author) to convey to our nostrils the extremely subtile *effluvia* which transpire from odoriferous bodies. Those detached particles are so imperceptibly small, that they would elude the most careful hand, or escape the nicest eye; but this trusty depository *receives* and *escorts* the invisible vagrants without losing so much as a single atom, entertaining us by this means with the delightful sensations which arise from the fragrance of flowers; and admonishing us, by the transmission of offensive smells, to withdraw from an unwholesome situation, or beware of pernicious food.'

Thus does the air administer to the senses of seeing and of smelling. Happy, however, ought we to account ourselves, that so often charged with noisome effluvia and noxious vapors, it does not render these susceptible to the taste; and although it certainly is a body corporeal, and may at times be felt, yet its resistance in ordinary cases, when it is unagitated and unconfined, is so undistinguishable as to occasion no inconvenience.

The region of the atmosphere is the great thoroughfare to the feathery creation; it is, if we may so speak, the king's highway for the fowls of heaven, where they perform their lengthened journeys with expedition and safety, and range and expatiate beyond the reach of danger. It is by this element also that the inhabitant of the waters is enabled to work his little philosophical engine with effect, for without the aid of this subtile fluid, the empty vesicle would have remained a piece of useless lumber.

We cannot as yet say, *there go the balloons*, as if the atmosphere, like the sea, had become the established medium of commerce and of travelling; but the air has already attained to such a degree of perfection, as to render it not improbable that a voyage in the air will be regarded one day, by the generality of mankind, with less awe than was evinced by those who first witnessed the adventurous navigator push his bark out of sight of land, beyond the pillars of Hercules.

As all the rivers run into the sea, and deposit their contents in its capacious bosom, so do all the exhalations that arise from terrestial bodies ascend into the atmosphere. To this capacious alembic take their flight, not only the aqueous vapors that proceed from the sea, the rivers, and moist places of the earth, but the steam or smoke of things melted or burnt; the perspiring fumes of whatever enjoys life; and the effluvia they emit when deprived of it, and in a state of putrescence. How then, it may be asked, is this heterogeneous mass preserved from corruption, and purified from its offensive qualities? for if by respiration, flame and putrefaction, air is rendered unfit for the support of animal life, there can be no doubt, (as Dr. Paley observes) by the constant operation of these corrupting principles, the whole atmosphere, if there were no *restoring* causes, would come at length to be deprived of its necessary degree of purity.

Among these causes the doctor mentions *vegetation*, and *agitation with water*, both of which have been proved by experiment to have the effect of atmospherical restoratives; for a sprig of mint, corked with a small portion of foul air, placed in the light, renders it again capable of supporting life and flame; and the foulest air shaken in a bottle with water for a sufficient length of time, recovers a great degree of its purity. Here we see the salutary effects of storms and tempests—the yesty waves, which confound the heaven and the sea, are doing the very thing, but upon a larger scale, which was done in the bottle! And in as far as the lower regions are concerned, these, on account of their wide extension, must be attended with most beneficial consequences; but as the sea, for its purity, is not dependent on any one cause, so the atmosphere, besides these external restoratives, will be found to contain in its own bosom a correcting principle which developes itself by its salutary operations, as we shall soon have occasion to notice, in speaking of some of the most remarkable of the phenomena of the atmosphere.

PHENOMENA OF THE ATMOSPHERE.

'Of what important use to human kind,
To what great ends subservient is the Wind?
Wherever the aerial active vapor flies,
It drives the clouds, and ventilates the skies;
Sweeps from the earth infection's noxious train,
And swells to wholesome rage the sluggish main!'

THE WIND.

Sometimes there is a profound calm; every wind is hushed, not a zephyr breathes over the face of creation, and not a breeze disturbs the glassy expanse of the lake; but the appearance is deceitful and short-lived; all on a sudden the wind is heard rustling among the branches—it gathers strength as it proceeds, and grows up into the majesty of a storm. Now the raging tempest spends its fury; houses are swept from their foundations; navies are rent from their anchors; trees are torn up by the roots. This we call *wind;* and whether its effects appear in the fury of the *gale*, the violence of the *hurricane*, the impetuosity of the *whirlwind*, the dryness of the *harmattan*, the deleteriousness of the *sirrocco*, or the mortifying influence of the *samiel*, it become us not to repine at the dispensations of the Almighty, or account those the most deplorable evils which are wisely sent us for the best of purposes.

We have already noticed the bad effects that would accrue were it not for the agitation of the ocean; but more dreadful would be the consequences

Did neither air nor ocean feel the wind.

Motion is the soul of the universe, it is as necessary in the air as in the ocean, and both are no less indispensable than the motion of the sap in plants, and the circulation of blood in animals.

It is, however, happily so ordered, that where putrefaction in a state of quiescence would soon prevail, wholesome breezes and salutary gales alternately spring up, to sweep destruction from the aerial fluid, and where heat is felt to an alarming degree, the atmosphere extends its airy wings to fan a fainting world!

'This principle (as Dr. Gregory observes,) we find realized on a great scale in what are called *the trade winds*, which blow constantly from east to west, near the equator. The sun rises in the east, and sets in the west, consequently the air will be heated gradually from east to west, and the wind will blow in that direction.' The same cause, this author remarks, will explain 'the *land* and *sea* breezes in the tropical climates; and the *monsoons*, though the theory of them be more complicated, originate in the same cause.

And as it is not only necessary that there be a continual agitation kept up in the ocean by means of the tides and currents, but in order to prevent its waters from being contaminated by those numerous loads of filth which are from all quarters poured into it, it is also requisite that it be furnished with something of a correcting nature, which it has in its saltness. So in the atmosphere, besides the perpetual motion kept up in it by means of the winds, and the beneficial consequences proceeding from vegetation and the agitation of the waters, there must be also some correcting quality, especially prevalent in the upper regions, where a number of the most noxious particles, and a considerable quantity of vitiated effluvia, must ascend, perhaps beyond the reach of the other purifying agents. This, it is probable, is the chief cause of the electric fluid, which, although it is found to pervade the whole mass of creation, is supposed to be much more copious in the upper than in the lower parts of the atmosphere.

In the lower regions of the firmament, indeed, the tremendous noise of the *thunder* is heard, and the vivid *lightnings* are seen to flash, but these only happen on extraordinary occasions, or where their presence is absolutely necessary to restore the equilibrium of the lower tracts, in the same manner as the tempest is sometimes sent to agitate in an uncommon degree the surface of the ocean; but far more frequent we may suppose is the busy working of the lightning in the higher regions of the air, although it may be concealed by the density of its lower extremities at times from our view. The glancing of the *wild-fire*, (as the vulgar style it,) and the playful skipping of the *aurora borealis*, give us sufficient intimation, that in the silent hours of rest and repose the great Supreme faints not, neither is weary, but is busily employed in the unceasing operations of his provinence. when our senses are locked in midnight slumbers, and refreshing sleep stretches her balmy wings over a fatigued world.

Besides these, which may be called the principal, there are also a number of other *fiery meteors.—Fire-balls*, in all the glare of terrific magnificence, are sometimes seen to rush across the hemisphere. *Falling stars* are observed to shoot with astonishing rapidity; the *Ignis fatuus*, *Will-with-the-wisp*, or *Jack-with-a-lanthorn*, as it is called, glides along by the sides of hedges or ditches in moist situations, and sometimes takes up his abode among the graves of the dead, or is seen in the neighborhood of dung-hills; but these, as well as the *fiery Dragon*, the *skipping Goat*, the *Dart*, and the *Lamp*, with every other appearance that the unsubstantial and airy form may assume, may all be accounted for on the principles of electricity.

WATERY METEORS.

In the regions of the air, a variety of watery meteors are formed. Here are *fogs*, the creation of those collections of vapors which chiefly rise from fenny moist places. These become more visible as the light of day decreaseth, and uniting with those that rise from the waters, so as to fill the air with their humid particles, are called *mists*. Sometimes, especially in the summer months, our morning walks sparkle with pellucid drops, and transparent globules hang pendant from every leaf in the form of pearly *dew*.

In the atmosphere, the balancings of the *clouds* are preserved till these swimming lakes are commisioned to discharge their contents, not in deluging torrents confined to particular spots, but in refreshing showers widely spread abroad in the form of drops of *rain*. Here, too, that wonderful phenomenon *snow* takes its rise, which is said to be composed of such vapors as are frozen while the particless are small; and *hail*, which is rain frozen, as *hoar* frost is said to be of the dew. *Water spouts* may be reckoned among the number of watery meteors, but having already been noticed in a preceding number, we shall pass them over, and proceed to the consideration of a few of the most remarkable

CELESTIAL APPEARANCES.

The wonderful and beautiful colors which we observe in the clouds, is owing to their particular situation to the sun, and the different modications under which they reflect his light. The various appearances and fantastic figures they assume, probably proceed from their loose and voluble texture, revolving into any form by the force or activity of the winds, or by the electricity contained in their substance.

But of all the celestial appearances we can behold, what can be compared to the beauty of the *rainbow?* What a majestic and stupendous arch does this wonderful phenomenon present to our view, and how beautifully is it tinged in regular order, by all the primogenial colors in nature!

Yet this gorgeous arch is instantaneously erected, and at no expense! the commission is sent forth, and it springs into existence, merely by the operation of the sunbeams on the watery particles that float in the atmosphere. The rainbow, it must be observed, is always seen in an opposite direction from the sun, and that it is occasioned by the reflection and refraction of his rays at a certain angle or distance from the eye of the spectator, must be evident to every person who has tried the experiment of the silly boy in the fable, and gone in pursuit of the treasures at the end of it.

Sometimes too we have *lunar* rainbows, but these shine with inferior lustre, and what more can we expect from the reflected light of a body, such as the moon, that shines itself by reflection? *Halos* are supposed to be occasioned by the refraction of the light of the sun or moon on the frozen particles that surround them in frosty weather; and what are called *parhelia*, or *mock suns*, and *paraselenes*, or *mock moons*, are only representations by the reflection of the face of the true sun or moon from some of the clouds, which are placed at a convenient distance to produce the effect.

QUESTIONS ON LYCEUM No. 30.

From what mountain in Europe was there a volcanic eruption in 1669?

With what velocity did the lava move, which was thrown out by this eruption?

What were the materials which composed the lava?

How far into the sea did the lava pass, and what effect did it have upon the water?

Are the principles of science simple or complicated in their nature?

What machines are most powerful, simple or complicated ones?

Which measures are most efficient in promoting science, simple or complicated?

Which are most favorable to pure religion, large or small churches?

What are the advantages of a geometrical analysis of the alphabet?

How old are the principles of Christianity, and in what are they founded?

What is the fundamental principle of christian science?

What must necessarily be the result of universal hatred and distrust to a moral universe?

What other sciences have a bearing upon christian science?

What arts may be applied to advance the practice of Christianity?

Was it the object of the Author of the christian religion to establish new principles for the regulation of a moral universe, or to inculcate old ones?

Which are most likely to enlighten and reform the world, simple or complicated machinery?

What proof have we that children can acquire the art of penmanship in their amusements?

Which will longest amuse a child, a slate and pencil or common toys?

Which has been found to give the most instruction to children, 'Family Apparatus,' and the 'Family Lyceum,' or a year's schooling?—and what is the comparative expense?

Is nickel a hard or soft metal, and what is its color?

By whom was potassium discovered, and what are some of its properties?

What is the color, and some of the other properties of bismuth?

What are the properties and uses of antimony?

In what state is arsenic found, and what are some of its uses?

With what other metals is cobalt associated, and what are its uses?

What are the different sources of heat?

What process is carried on in combustion?

What is the object of the Boston Academy of Music?

When does the School Agent Society meet, and what are its objects?

What state at the south has taken measures to procure a geological survey of its territories?

Which have it in their power most to promote the prosperity of summer schools, ladies or gentlemen?

In what way can ladies promote the success of summer schools?

How can they aid teachers, and how encourage pupils?

What are some of the uses of the animals of the sea?

In what seas is the whale found?

What are some of the most distinguishing properties of the atmosphere?

Is the atmosphere visible or invisible?

Has the atmosphere any power of reflecting light?

To what height is the atmosphere supposed to extend?